

**Overview of draft organizational
structure
of
Studies of Emissions and Atmospheric
Composition, Clouds and Climate
Coupling by Regional Surveys
(SEAC⁴RS)**

**Brian Toon
University of Colorado,
Boulder**

SEAC⁴RS Goals

- 1. Determine how pollutant emissions are redistributed via deep convection throughout the troposphere.**
- 2. Determine the evolution of gases and aerosols in deep convective outflow and the implications for UT/LS chemistry.**
- 3. Identify the influences and feedbacks of aerosol particles from anthropogenic pollution and biomass burning on meteorology and climate through changes in the atmospheric heat budget (i.e., semi-direct effect) or through microphysical changes in clouds (i.e., indirect effects).**
- 4. Serve as a calibration/validation test bed for future satellite instruments and missions.**

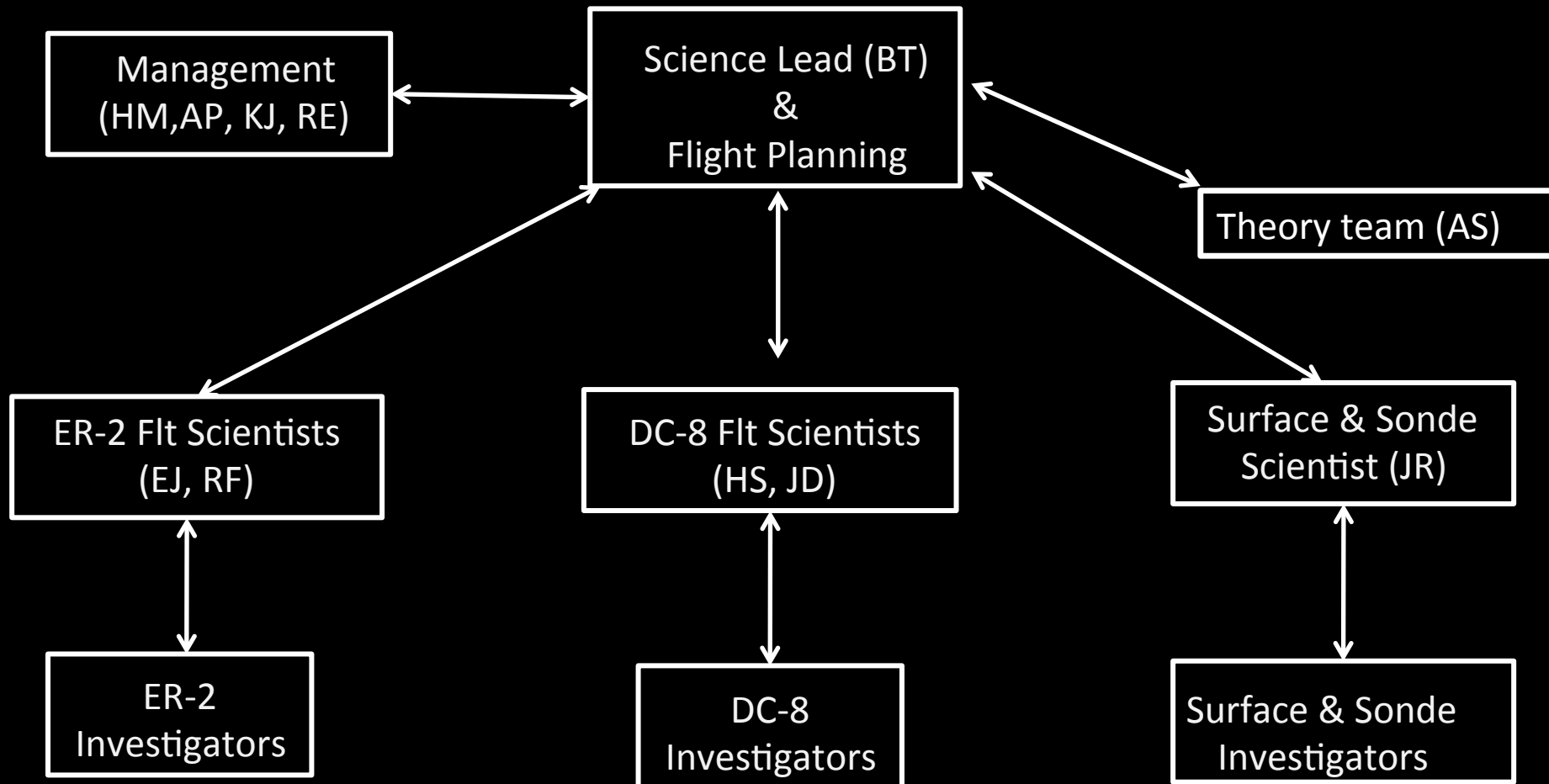
Four Focused Studies

- **Air chemistry over the Southeastern US including incorporation of aerosols into convective systems and their impact on cloud properties; cooperating projects: Discover-AQ, SENEX**
- **Forest Fire Emissions transport and incorporation into convective systems and their impact on cloud properties; cooperating project: BBOP**
- **North American Monsoon and the vertical redistribution of atmospheric constituents**
- **Hurricane influence on the vertical redistribution of atmospheric constituents; cooperating project: HS3**

Some challenges and opportunities in SEAC⁴RS

- **Large complex mission**
- **Diverse science goals**
- **Extended time period**
- **Large number of flights**
- **Complex operating area**
- **Need to involve large numbers of people in decisions**
- **Need to make timely decisions**

General Science Lines of Communication



Who's Who - Management

- **NASA HQ Management – Hal Maring, Ken Jucks, Alex Pszenny, Richard Eckman**
- **Project Manager – Kent Shiffer, Jhony Zavaleta**

Who's Who - Science

- Campaign leader-Brian Toon
- DC-8 Flight Scientists – Hanwant Singh, Jack Dobb
- ER-2 Flight Scientists – Eric Jensen, Rich Ferrare
- Ground and Balloon Measurement Coordinator – Jeff Reid

Who's Who - Science Operations

- **Forecasting Team Leader – Lenny Pfister (Henry Fuelberg, Jim Bresch)**
- **In-Flight Aircraft Control Team –Eric Jensen, Johnny Luo**
- **Flight Planning Team – *SE Chemistry*: Daniel Jacob, Jeff Reid, *Fires*: Bob Yokelson, Jens Redemann, *Hurricanes*: Lenny Pfister, Johnny Luo, *NAM*: Eric Jensen, Laura Pan**

We need to span the U.S. to access time variable phenomena- base in Houston



We need to span the U.S. to access time variable phenomena - some flights from Palmdale



Science goals - Air chemistry over the Southeastern U.S.

- Track the changing chemistry between August and September
- Examine the interactions between natural and anthropogenic emissions
- Collaborate with Discover-AQ, SENEX
- Examine aerosol properties and ability to retrieve them remotely
- Investigate convective pumping into UTLS

Science goals - Fires

- Examine composition, physical and optical properties of smoke
- Verify remote retrievals of smoke properties
- Determine smoke radiative heating rates
- Investigate aerosol effects on clouds
- Investigate convective transport of smoke
- Examine the interactions between fire emissions and anthropogenic pollution and impact on air quality

Science goals - North American Monsoon

- Determine outflow level from cumulus
- Investigate cloud processing
- Determine role of NAM in troposphere to stratosphere transport
- Study cloud microphysics and radiation
- Investigate clear sky transport and chemistry















Science goals - Hurricanes

- Investigate large scale transport into the stratosphere.
- Collaborate with HS3.
- Measure properties of clouds, and compare with remote sensing retrievals

Approximate Calendar














August 2013

150 flt hrs-DC-8, ER-2

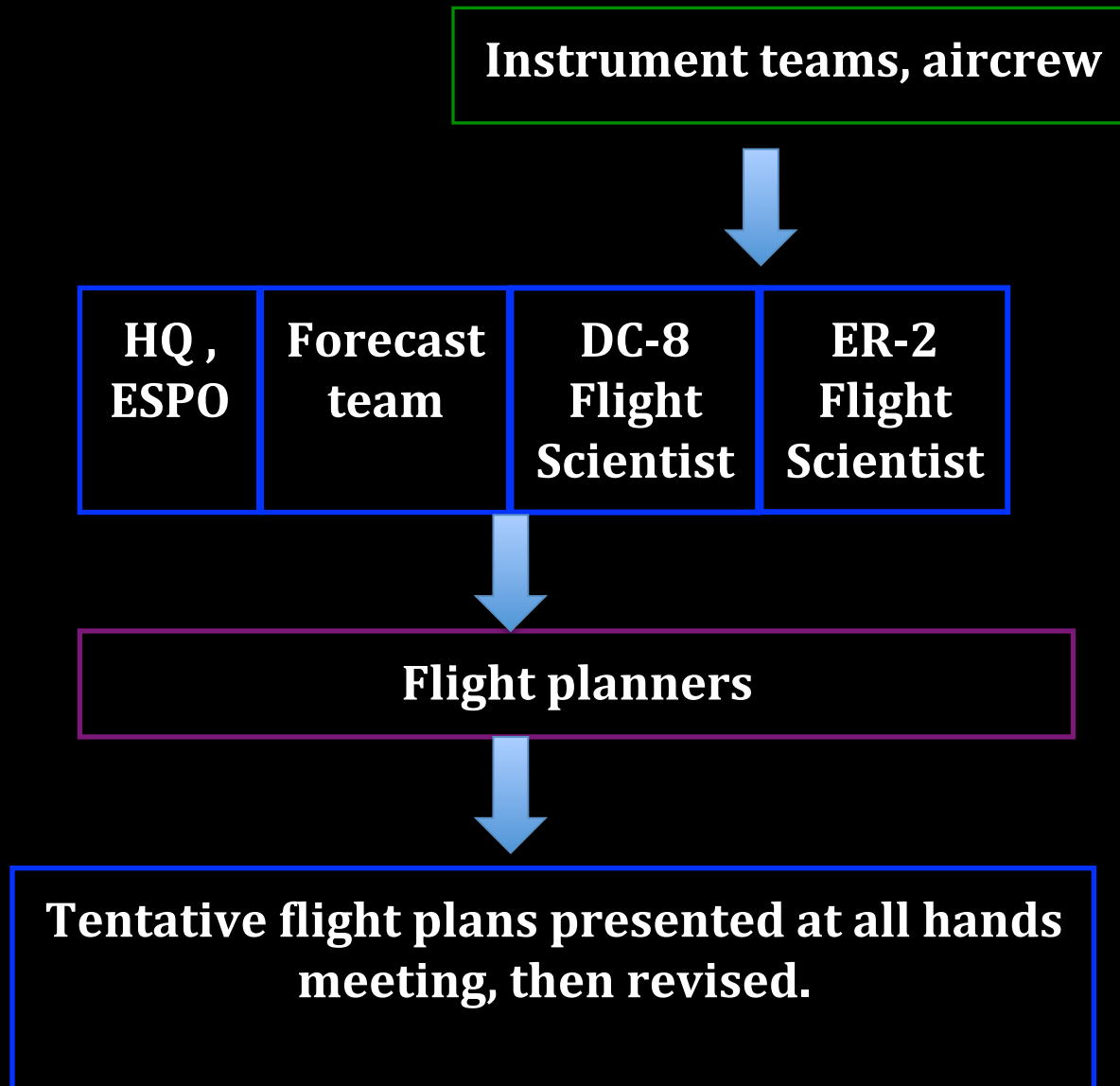
Sunday	Monday	Tuesday	Wed	Thur 1	Fri 2	Sat 3
4	5	6	7 	8	9 	10
11 	12 	13	14 	15	16 	17
18 	19 	20	21 	22	23 	24
25 	26 	27	28 	29	30 	31

Approximate Calendar

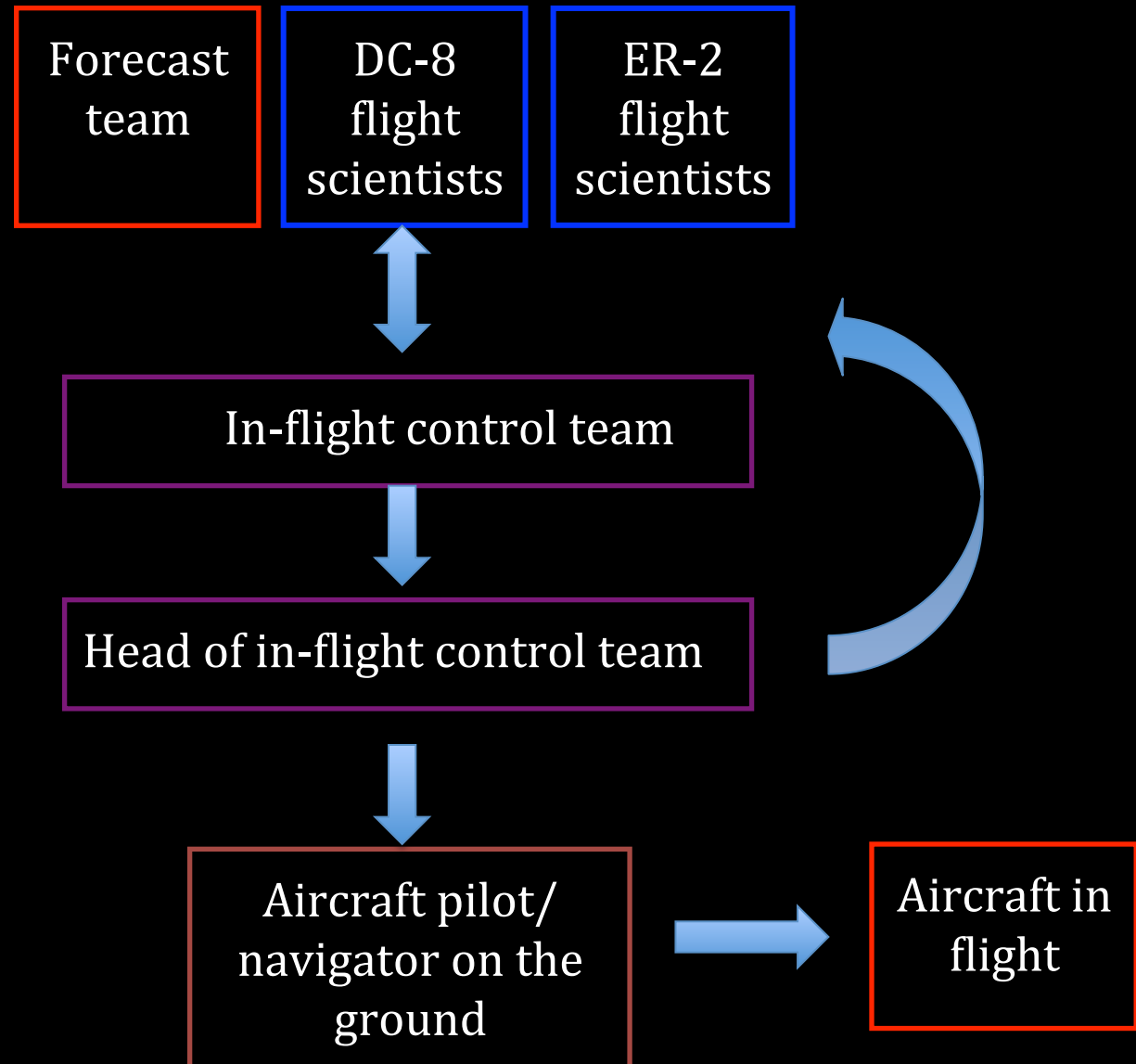
September 2013

Sun 1	Mon 2	Tues 3	Wed 4	Thur 5	Fri 6	Sat 7
						
8 	9 	10	11 	12	13 	14
15 	16 	17	18 reserve	19	20 reserve	21
22 reserve	23 	24 reserve	25 reserve	26 reserve	27 reserve	28 reserve
29 reserve	30 	1	2	3	4	5 

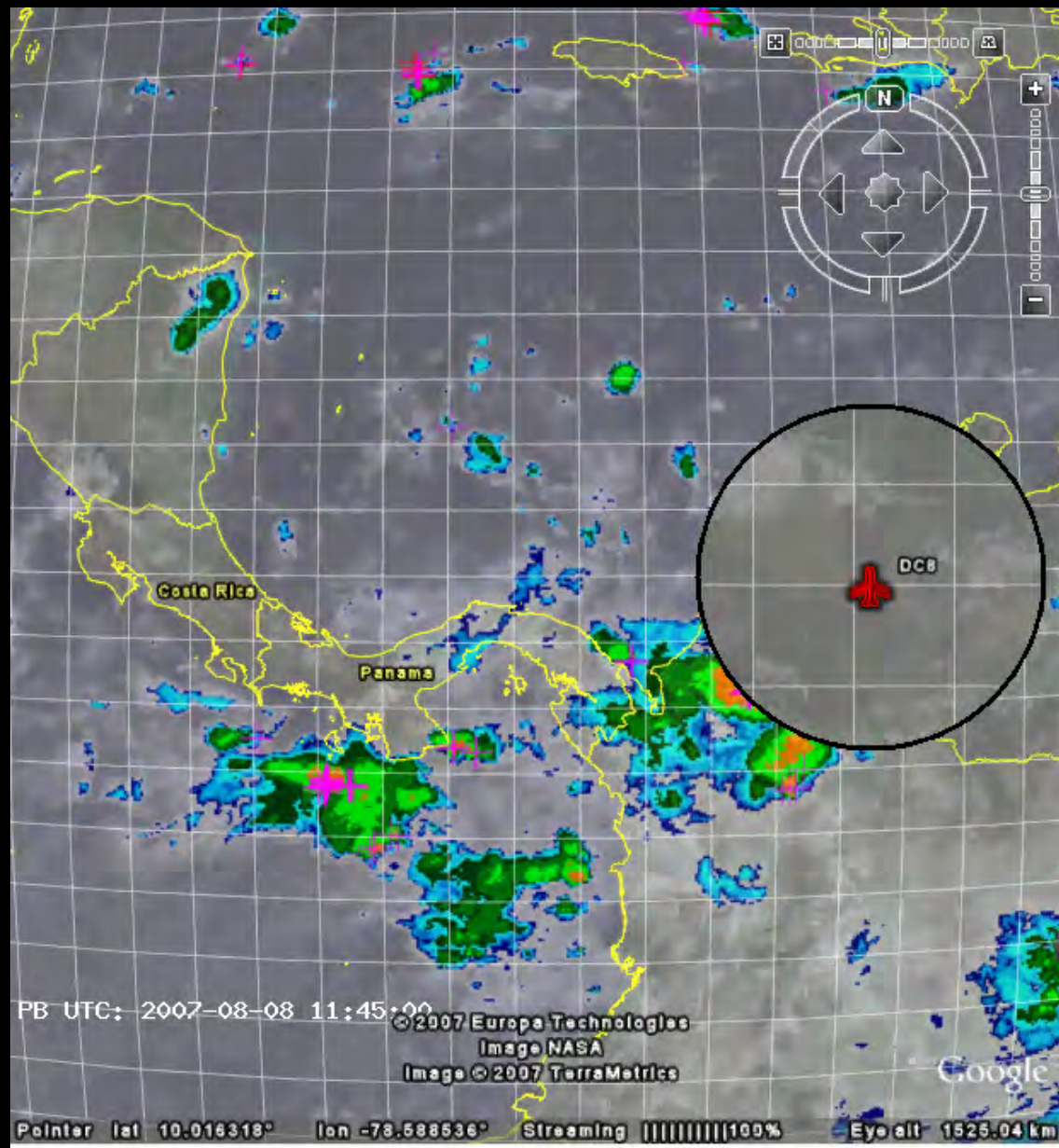
Flow chart for flight planning



Flow chart for flight operations



Coordinated flying



Typical Flight Day

- TO-4 Project scientist arrives decides if the current flight plans will work
- TO-4 Flight planners arrive -revised flight plans devised as needed.
- TO-3 ER-2 hands on.
- TO-2 ER-2 hands off.
- TO-2 DC-8 power on.
- TO-1 Aircraft in-flight control group arrives
- TO Aircraft take off –ER-2, DC-8
- TO In-flight control group takes control of planes.

Typical Flight Day

Flight planning team discusses ideas for next flight

Forecasting team looks at 2-day forecast

Preliminary flight plans for next flight are constructed

TO + 8hrs	ER-2 returns to base
-----------	----------------------

Landing + 1hr	ER-2 pilot debriefing
---------------	-----------------------

TO+ 8 hrs	DC-8 return to base.
-----------	----------------------

Landing + 1hr	DC-8 debriefing
---------------	-----------------

Instrument and flight status reports posted to ESPO
web site.

Typical Day before flight

- 9 AM** **Forecasting team looks at forecast for next day**
- 10 AM** **All Hands Science team meeting-Forecast for tomorrow. Presentation of flight plan for next day. Discussion of flight plan. Report by flight scientist from each flight team. Presentations of interesting new science results (note instrument descriptions banned, sales jobs banned. Only new and interesting results.) Logistics discussed.**
- 12 noon** **Flight plans designed.**
- 4 PM** **Final flight plans given to pilots.**

We are open to ideas about this
organizational structure-talk to your
flight scientist, or Brian